Introduction to Stream Restoration

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Presentation Topics

- Stream System Dynamics
- Bankfull Discharge
- Stream Types
- Candidate Restoration Sites
- Restoration / Enhancement Activities

Universal Laws of Streams

- Seek a state of stability
- Seek most efficient transfer and uniform distribution of energy

Streams Seek a State of Stability

Stable Stream - The ability of a stream to transport the water and sediment of its watershed in such a manner to maintain its dimension, pattern, and profile, over time, without either aggrading or degrading

Stability is Achieved by Balancing Multiple Variables

- Valley morphology
- Channel slope
- Stream flow
- Sediment regime
- Channel dimensions

Streams Seek a Naturally Stable Sinuous Pattern

- Main factors are landscape position & valley slope
- Others include sediment load, stream flow, bed & bank materials
- Sine-generated curve


Posey Hollow
SHENANDOAH
FORK
NORTH
Brook
Rhodes
Doll Ridge
Ridge
Wright
Ridge
MOUNTAIN
VALLEY
MOUNTAIN
TOP
FORT
GEORGE WASHINGTON
Powells Fort Camp
Keller
Mudhole Gap
Little Passage Cr
Duncan Gap
Ford
BM 633
BM 612
BM 610
Cem
Tailings
738
765
775
749
752
792
625
589
1754
1275
1658

Degree of Stability is Influenced by Watershed Characteristics

Causes of instability include:

- Filling or dredging
- Dams
- Road crossings
- Vegetation removal or conversion
- Impervious surfaces
- Hardened stream banks
- Livestock access

Characteristics of Unstable Streams

- Channelized – unusually straight
- Improper sinuosity – irregular or unusually sharp meanders
- Eroded banks – no vegetation, vertical, slumping, exposed roots
- Aggrading – wide and shallow channel
- Degrading – narrow and deep channel (incised)
- In-stream sediment bars / islands
- Altered riffle-pool spacing or lack of features
- Multiple channels
- Significant debris and blockages

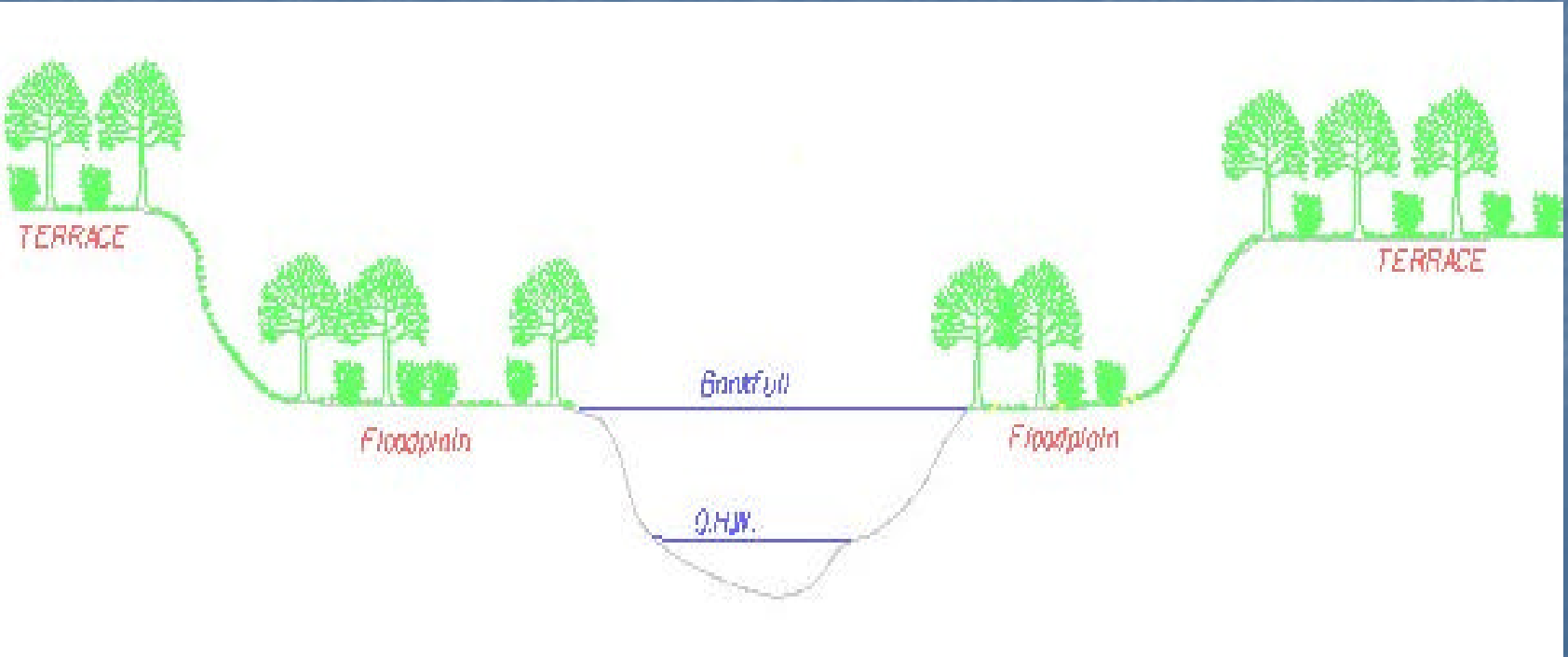
Bankfull Discharge

Why is it Important?

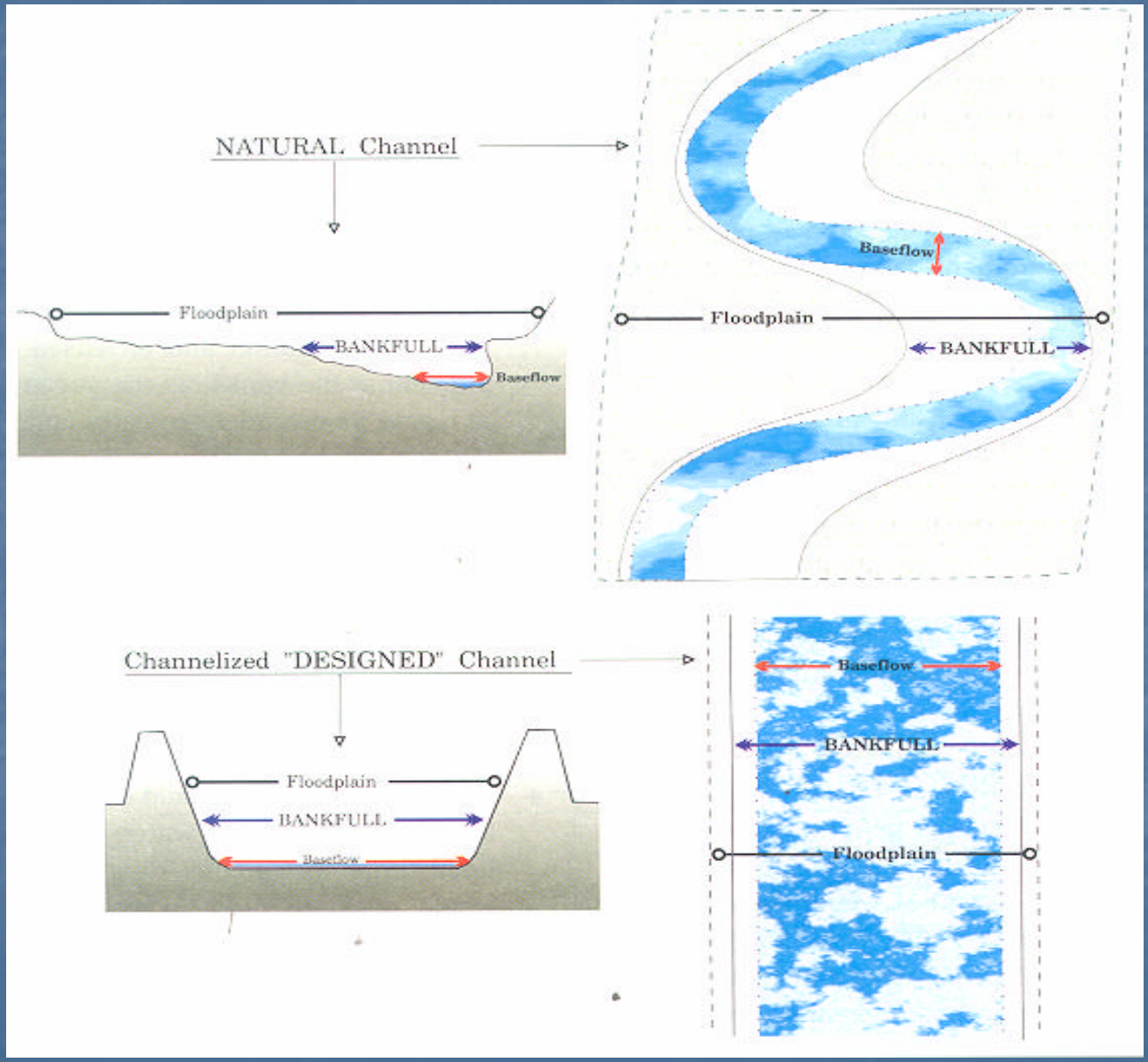
- Bankfull discharge is the primary factor responsible for shaping the stream channel
- In most “natural” streams this corresponds to the 1.5 to 1.8 year storm event

Bankfull Discharge

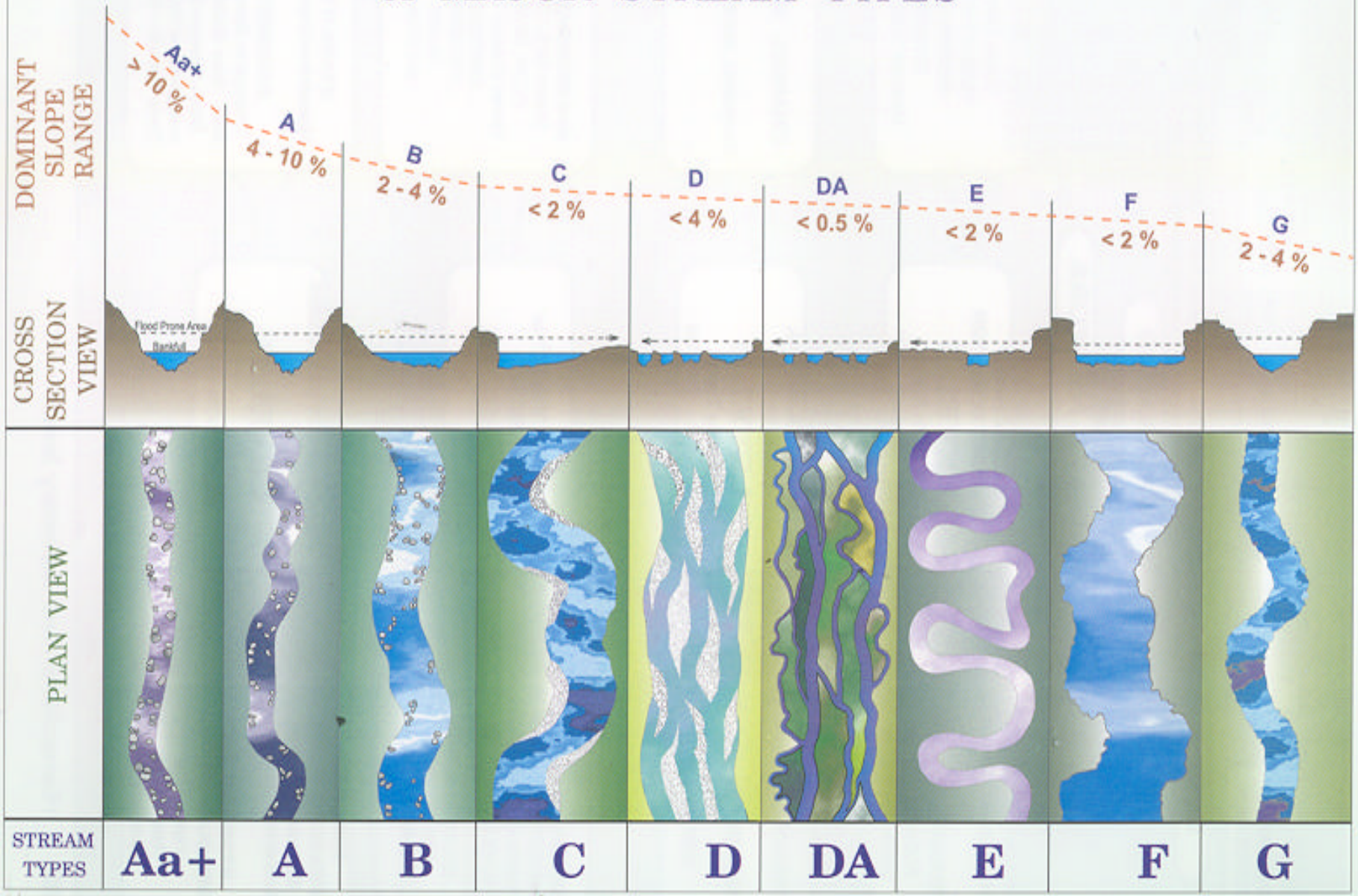
- Is the point at which water starts to flow onto the floodplain
- In a non-incised stream this will be the top of the bank



Natural vs. Engineered Channels



LONGITUDINAL, CROSS-SECTIONAL and PLAN VIEWS of MAJOR STREAM TYPES



Characteristics of Potential Stream Restoration Sites

Unstable Stream

- Channelized
- Improper sinuosity
- Eroded banks
- Aggrading
- Degrading
- In-stream sediment bars / islands
- Altered riffle-pool spacing
- Multiple channels
- Significant debris and blockages

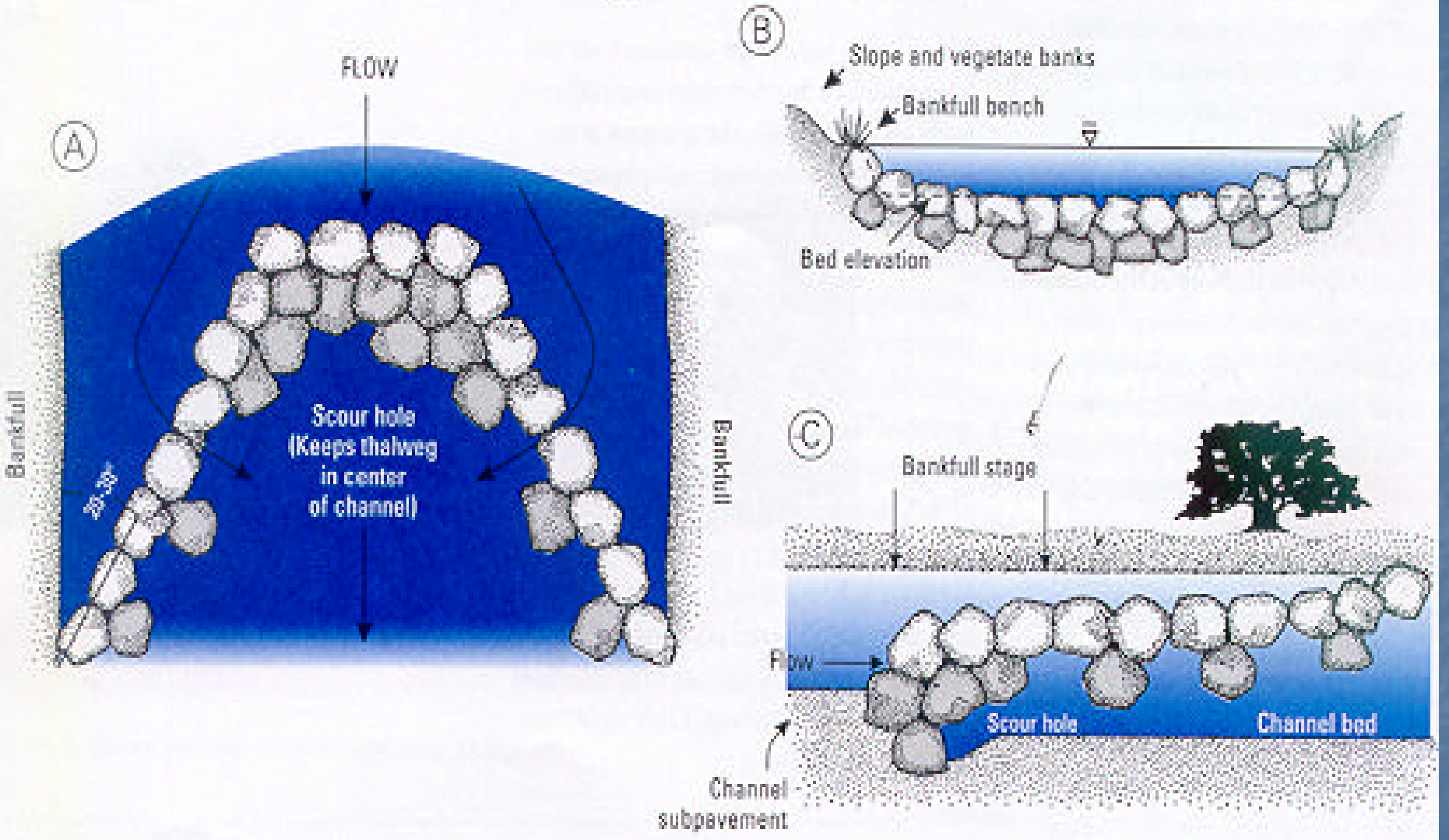
- Good constructability
  - Access
  - Onsite Mobility
- Ability to meet stream design requirements
- High likelihood of success
  - Location in watershed
  - Surrounding land use
  - Community related constraints

Stream Restoration / Enhancement Activities

- Total reconstruction
  - Dimension
  - Pattern
  - Profile
- Streambank stabilization
  - Re-shape, seed, and plant streambank
  - Bio-engineering techniques
- In-stream structures
- Re-connect to floodplain (bankfull bench)
- Riparian buffer planting
- Livestock exclusion


5. 2. 2005

Figure 8. (a) Plan view, (b) cross-section, and (c) profile views of cross vane.



Note: There should be no gaps between the rocks in the cross vane.


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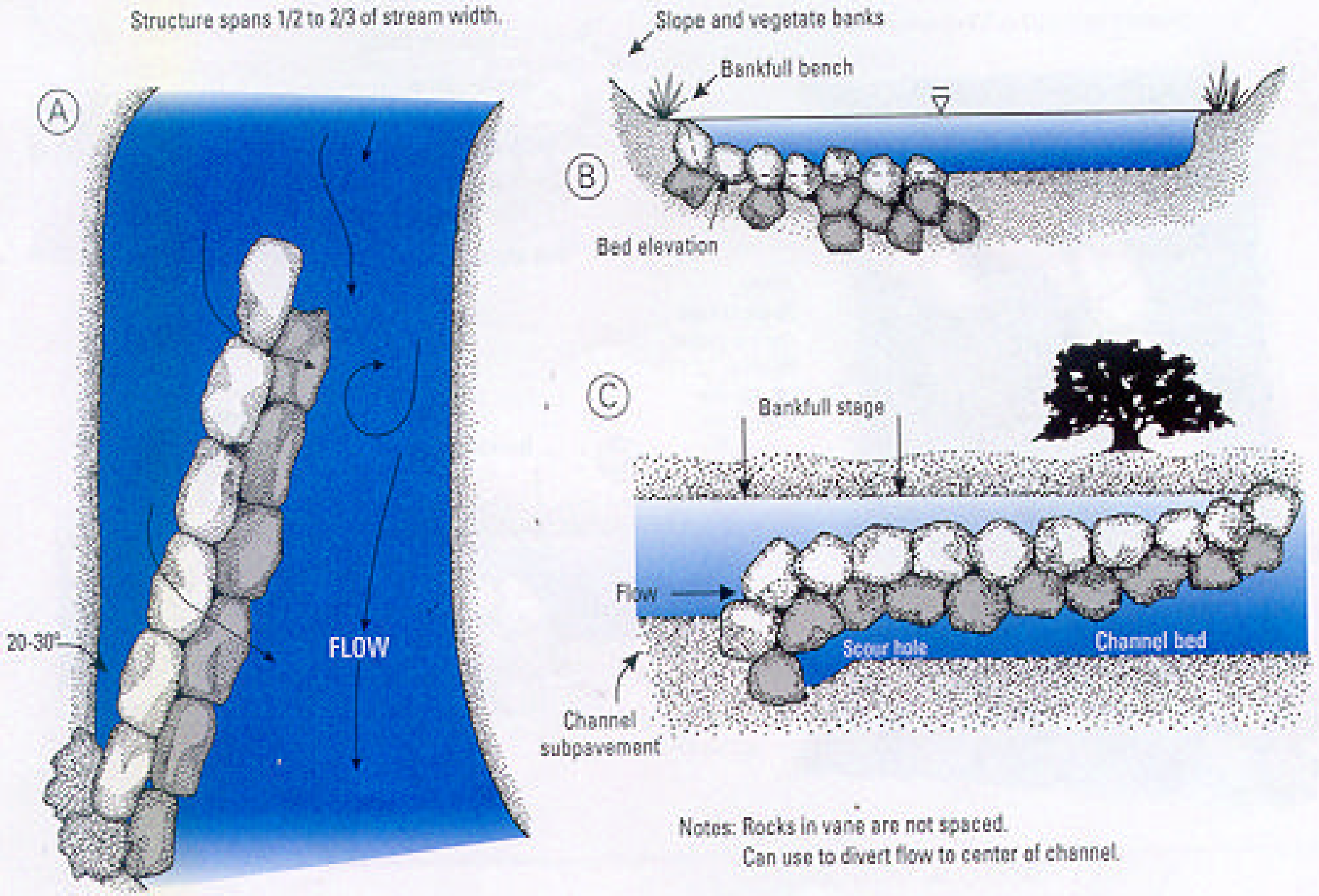
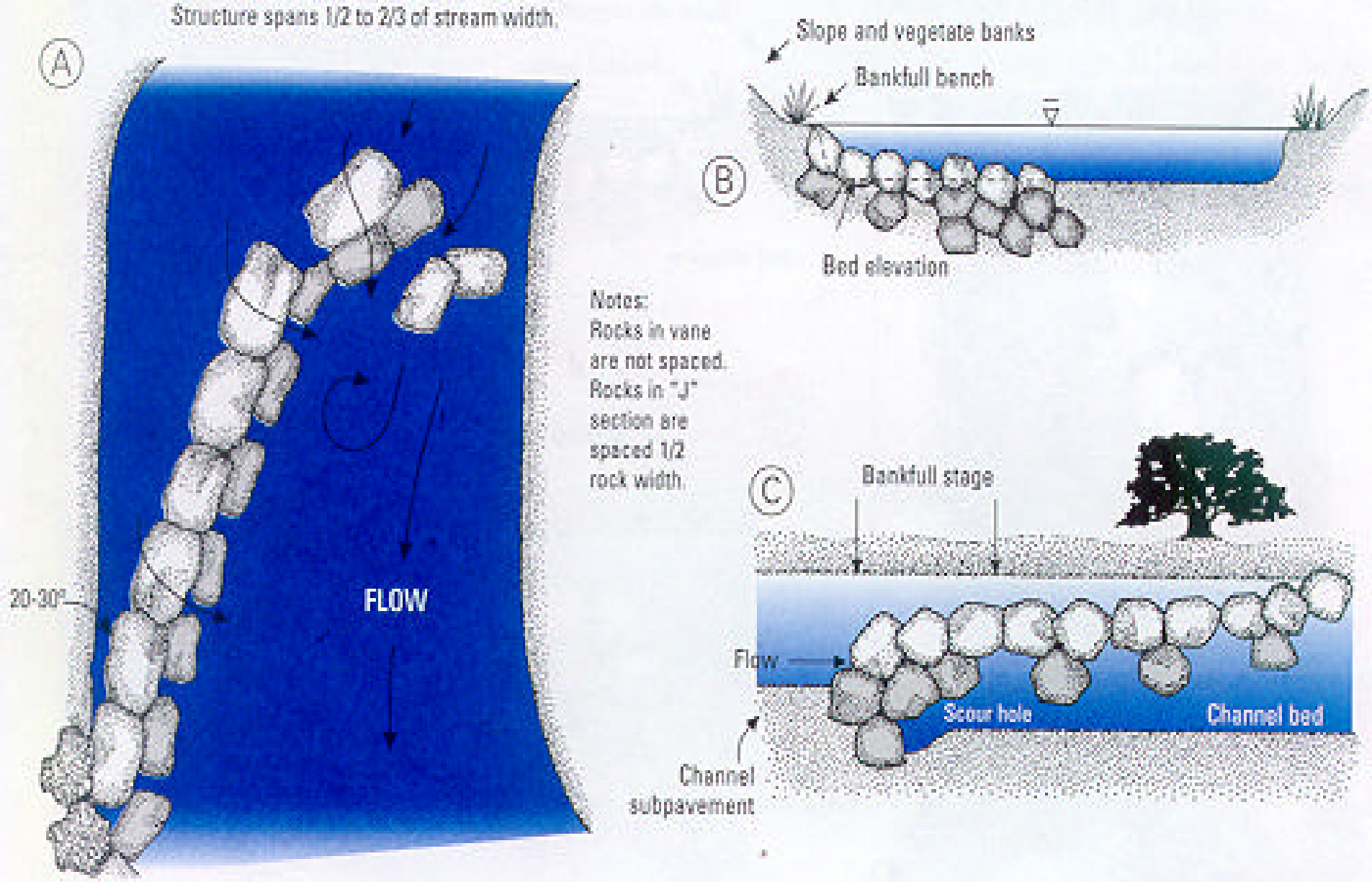
Figure 6. (a) Plan view, (b) cross-section, and (c) profile views of a rock vane.



Notes: Rocks in vane are not spaced.
Can use to divert flow to center of channel.

Figure 7. (a) Plan view, (b) cross-section, and (c) profile views of J-hook vane.

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Questions

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